NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

DELAYED ENTRY PROGRAM ATTRITION:
A MULTIVARIATE ANALYSIS

by

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June 1999

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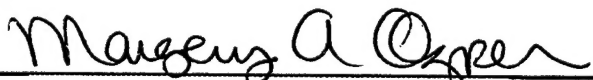B.S., United States Naval Academy, 1993

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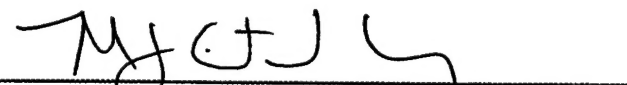requirements for the degree of

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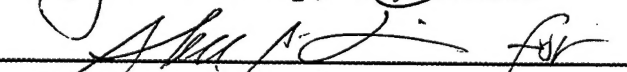
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ABSTRACT

This thesis uses binary logit models to examine the effects of personal background characteristics and local area economic conditions on an individual's likelihood to leave the Delayed Entry Program (DEP). The DEP allows individuals to contract for enlistment up to one year prior to starting basic training. Between fiscal years 1991 and 1996, over 1.1 million individuals joined the DEP for all four military branches, yet 167,134 (15 percent) never entered basic training. The Defense Manpower Data Center (DMDC) provided a data file that included all individuals who joined the DEP between October 1989 and June 1996. The DMDC raw data file was merged with county-level unemployment data provided by the Bureau of Labor Statistics. DEP attrition was modeled as a function of gender, educational level, dependent status, Armed Forces Qualification Test (AFQT) score, race, ethnicity, moral waiver status, and county-level unemployment rates. Results show that a person's likelihood of leaving the DEP is affected most strongly by gender and educational level. Women and high school seniors are more likely than men and high school graduates to leave the DEP. County-level unemployment rates have a significant, but small, negative effect on DEP attrition.

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I. INTRODUCTION

A. BACKGROUND

Each year, military recruiters face a typically
difficult challenge of finding the required quantity and
quality of volunteers to join the armed forces. When the
nation's economy flourishes and unemployment declines, as
in the late 1990s, a recruiter's job becomes even more
challenging.

Since the inception of the All-Volunteer Force during
the 1970s, the services have used the Delayed Entry Program
(DEP) to assist them in their recruiting mission. The DEP
allows individuals to contract for enlistment up to one
year prior to starting basic training. This policy allows
high school seniors to enlist prior to graduation and
smoothes the flow of new recruits into basic and advanced
training facilities.

The DEP is only a small portion of the recruiting
process, which culminates when an individual begins his or
her first day of active duty. This section provides the
reader with a basic understanding of several important
components of the recruiting process and some of its
problem areas, such as recruit attrition. Recruit

attrition from the DEP forms the primary focus of the study, and it is described within the context of the recruiting process, as managed by the four military services.

B.   DELAYED ENTRY PROGRAM (DEP) ATTRITION

Persons who enter the DEP but do not make it to basic training are considered "DEP attrites." Between fiscal years 1991 and 1996, over 1.1 million individuals joined the DEP, yet 167,134 (15 percent) never entered basic training.   Table 1.1 shows the total number of persons who joined the DEP during this period and their subsequent status (entered the military or dropped out of DEP) by gender and military service. Some individuals decide to renege on their contracts and leave the DEP. When individuals sign a contract to enlist, they are legally bound to fulfill this contract. However, this commitment is not enforced. In fact, the Navy's recruiting leadership manual specifically states:

> Under no circumstances will threats be used to get a
> DEP to ship. Do not force the contract down the DEP
> Recruit's throat. This will only make the DEP Recruit
> run faster.   (COMNAVCRUITCOMINST 1133.6B)

Not all DEP attrition is voluntary. Some persons are forced to leave the DEP for medical reasons or for

Table 1.1 Number of Delayed Entry Program (DEP) Participants by Status, Gender and Military Service, Fiscal Years 1991-1996

Gender and DEP Status*	Army	Navy	Marine Corps	Air Force	DoD
Men					
DEP Drops	38,033	37,055	35,470	14,911	125,063
Entered Active Duty	263,817	239,474	158,352	125,755	787,804
Total: DEP Accessions	301,850	276,529	193,822	140,666	912,867
Women					
DEP Drops	14,883	11,809	3,860	9,142	39,674
Entered Active Duty	58,431	41,385	9,544	38,971	148,351
Total: DEP Accessions	73,314	53,194	13,404	48,113	188,025
All					
DEP Drops	52,898	47,810	39,373	23,975	167,134
Entered Active Duty	322,266	281,913	167,853	164,804	933,758
Total: DEP Accessions	*375,164	329,723	207,226	188,779	1,100,892

Source: Derived from a special database provided by the Defense Manpower Data Center.

*Note: DEP accessions include all persons who entered the program between October 1991 and June 1996. Status (entered active duty or dropped out) is determined as of July 1998.

misconduct.   Overall, the Department of Defense experiences a rate of DEP attrition annually between 14.1 and 16.6 percent.

As seen in Table 1.2, DEP attrition rates for men are highest in the Marine Corps, at 18.3 percent.   At the same time, the Marine Corps has the highest DEP attrition rate for women at 28.8 percent.   The lowest DEP attrition rates of the four services are found in the Air Force: 10.6 percent for men and 19.0 percent for women.

Table 1.2 Delayed Entry Program (DEP) Attrition Rates (Percent), by Gender and Military Service, Fiscal Years 1991-1996

Gender and Fiscal Year	Army	Navy	Marine Corps	Air Force	DoD
Men					
1991	10.8	12.9	19.3	11.2	13.1
1992	10.3	16.7	17.0	9.6	13.6
1993	12.1	13.2	17.4	12.4	13.6
1994	13.3	11.6	18.5	11.0	13.7
1995	15.6	13.1	19.0	10.3	14.9
1996	14.5	11.5	18.5	8.3	13.6
Total	12.6	13.4	18.3	10.6	13.7
Women					
1991	15.8	24.0	27.3	21.1	20.3
1992	17.1	17.7	24.9	17.5	17.9
1993	19.7	20.8	29.7	20.5	20.9
1994	21.1	19.8	30.0	20.4	21.1
1995	23.9	25.9	30.4	18.5	23.7
1996	22.9	26.0	29.7	16.1	22.4
Total	20.3	22.1	28.8	19.0	21.1
All					
1991	11.8	13.9	19.8	13.4	14.1
1992	11.6	15.8	17.4	11.4	14.3
1993	13.4	14.4	18.2	14.4	14.8
1994	14.8	13.4	19.2	13.5	15.1
1995	17.5	16.0	19.8	12.5	16.6
1996	16.5	14.0	19.4	10.6	15.4
Total	14.1	14.5	19.0	12.7	15.2

Source: Derived from a special database provided by the Defense Manpower Data Center.

C. OTHER TYPES OF ATTRITION

First-term attrition is defined as the failure of a new recruit to complete his or her first term of enlistment. Levels of first-term attrition have remained fairly constant over recent years at around 33 percent of each recruit cohort (all recruits who enter active duty during a given year). About one-third of first-term attrition among a cohort is due to people who leave during the first 6 months of active service. Early attrition has varied between 10 and 14 percent in recent years. (GAO/NSIAD-97-39) By comparison, DEP attrition has varied between 14.1 and 16.6 percent between 1990-1996. (Table 1.2)

D. THE RECRUITING PROCESS

Together, the armed services employ approximately 12,000 recruiters who are located at 5,500 recruiting stations. These recruiting stations process entrants at one of the 65 Military Entrance Processing Stations (MEPSs). Each service trains its recruiters at different schools. The Air Force is the only service in which recruiters are assigned to the job on a completely voluntary basis. The Army, Navy, and Marine Corps have a combination of selection teams and screening processes to choose their new recruiters. (GAO/NSIAD-98-58)

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The recruiting process can begin with a referral, potential lead, phone call, or a simply an interested "walk-in." Once an individual makes the decision to join the military, a recruiter leads him or her through the application process. The enlistment process formally begins when the individual takes the Armed Services Vocational Aptitude Battery (ASVAB). This battery of tests is used to determine basic eligibility to enlist, through the Armed Forces Qualification Test (AFQT), as well eligibility for assignment to training in one of the military's many occupational areas.

The next step in the application process occurs at a MEPS, where applicants provide a medical history and undergo medical examinations by physicians. Another physical exam occurs just prior to basic training. Persons who fall outside the prescribed medical standards may be completely disqualified for military service or may be required to obtain a medical waiver from the appropriate level of command. This level varies depending on the reason for the waiver. Similarly, admission of drug use, a self-disclosed history of legal problems, or a record of misconduct may require a moral waiver. Moral waiver categories include felony, non-minor misdemeanor, pre-

service drug use, and minor traffic violations. Waivers for non-minor misdemeanors and pre-service drug use constituted nearly 75 percent of all waivers granted during fiscal years 1990-1997. (GAO/NSAID-99-53)

The DEP entrance process culminates when the individual is sworn into the Individual Ready Reserve (IRR), formally taking an oath of allegiance, and signing a contract. Officially, these individuals are now obligated to serve in the military. As previously noted, however, the services generally do not enforce this requirement. Persons enrolled in the DEP remain in an unpaid status while waiting for basic training to begin.

The final step in the enlistment process occurs just prior to basic training. Individuals must return to the MEPS, pass another medical exam, sign a second enlistment contract, and take another enlistment oath as an active duty service member. From the MEPS, individuals proceed to their respective basic training facility.

The Navy trains all of its recruits for nine weeks at one location, the Naval Training Center in Great Lakes, Illinois. Lackland Air Force Base in San Antonio, Texas is home for Air Force basic training. Air Force basic training is the shortest of all services, at only six

weeks. Army basic training lasts 8 weeks at bases in Missouri, South Carolina, Georgia, Kentucky, Oklahoma, and Alabama. The Army, Navy, and Air Force train their male and female recruits together. The Marine Corps segregates men and women during basic training. All women Marines train for 11 weeks in Parris Island, South Carolina. Male Marines train for 12 weeks in Parris Island or San Diego, California. (GAO/NSAID-98-58)

Upon graduation from basic training, individuals generally proceed to training for a military occupation, unless designated for general assignment or other duty. All Marines, however, must train for three additional weeks at Marine Combat Training in either California or North Carolina prior to embarking on their specific occupational job training.

Not all individuals successfully complete basic training. The services reward recruiters differently in this area. The Navy and Marine Corps offer performance awards to recruiters based upon the number of persons recruited who successfully complete basic training. The Army and Air Force, which access more than 55 percent of all new recruits annually, reward recruiters for the number of DEP entrants or persons who report to basic training.

The Army and Air Force "believe that a recruiter should not be penalized for a recruit's failure to complete basic training." (GAO/NSAID-98-58) As noted in a General Accounting Office (GAO) study of Military Attrition:

> Basic training officials from all services told [GAO] that recruiters do not have adequate incentives to ensure that their recruits are qualified medically, morally, and psychologically. That is, these officials believe that recruiters are driven by their monthly goals to recruit persons who may not be fully qualified and that recruiters do not have incentive to thoroughly probe applicants to learn of possibly disqualifying medical, psychological, or criminal problems. (GAO/NSAID-97-39)

In 1998, GAO recommended to the Secretary of Defense that recruiter awards be more closely tied to recruits' successful completion of basic training. (GAO/NSAID-98-58) Manpower policy makers use performance incentives to achieve personnel goals and manage the force. Although the services currently employ varying policies in this area, they all have the same mission--to make recruiting goal.

E. DEP MANAGEMENT

Just as recruiter incentive policies vary, DEP management programs also vary among the services. The Navy has specific guidelines regarding contact requirements between recruiters and DEP participants. Navy recruiters

must contact all members of the DEP at least five times monthly. Three of these contacts can be by phone, one must be face-to-face, and another must be a monthly DEP meeting. Additionally, the Navy prohibits certain DEP functions, such as picnics and parties. The Navy has added a Personnel Qualification Standards (PQS) program to its DEP. The DEP PQS system parallels its active-duty PQS system. DEP participants have an actual lesson plan of required knowledge. This knowledge is tested regularly by recruiters. Within the DEP, participants are assigned duties to manage their own program. Recruiters maintain overall responsibility for the program. (COMNAVCRUITCONINST 1133.6b)

The Marine Corps approaches its DEP management much differently than that of the Navy. The Marine Corps has established guidelines, but allows recruiters some freedom to operate within those guidelines. Sergeants Major manage the Marine Corps DEP programs, which require weekly contact and monthly DEP meetings. Marine Corps recruiters are encouraged to be creative with their DEP activities. (MCRCO 1133.1)

The Army has similar requirements for its DEP program. Army Recruiters must have an initial meeting with all new

DEP participants within 3 to 10 days after enlistment.
Additionally, Army recruiters must contact DEP participants
every two weeks, and meet face-to-face at least monthly.
As in the Navy, the Army's requirements are very specific.
Contact frequency between recruiter and DEP enrollee
increases to weekly at 45 days prior to enlistment,
alternating between face-to-face and phone contact.
(USAREC Regulation 601-95)

From day one in the DEP, Air Force recruiters refer
to all DEP participants as "airmen." This provides a sense
of belonging to a team as well as establishes a
supervisor/subordinate relationship. Within 72 hours of
entering the DEP, airmen must sign an informal contract
acknowledging their responsibilities in the DEP. Prior to
entering active duty, airmen are encouraged to find at
least one qualified referral to join the DEP. As in the
Navy, recruits in the Air Force DEP are assigned certain
leadership billets and responsibilities. Individuals are
"sworn in" and given a "change of command" when assuming
DEP billets. This formality shows the importance of the
position and teaches military customs. The Air Force
refers to DEP drops as "cancellations." The DEP Management
Guide highlights specific DEP behaviors that may indicate a

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possible cancellation, such as missing monthly DEP meetings. Each phone call, face-to-face meeting, and DEP meeting is intended to "motivate, re-qualify, and perpetuate." Every 30 days while in the DEP, Airmen must complete a questionnaire indicating any changes in dependence, health, or moral status (such as police involvement or traffic tickets). (USAF DEP Management Guide, 1998)

F. DEP PURPOSE

Despite the services' DEP management differences, they share the same DEP purposes. First, the DEP provides a pool of applicants to fill future months' shipping goals. In fact, the Marine Corps refers to the DEP as the "National Pool Program," and members of the DEP are referred to as "poolees." Each service specifies various percentages of the DEP for future months. The Marine Corps requires that at least 25 percent of its recruiting mission come from DEP referral sources. (MCRCO 1133.1) For example, if a station's monthly mission requires 8 new recruits, at least 2 of those individuals should be from poolee referrals. Referrals can earn "poolees" points toward promotion after they enter active duty.

The DEP also helps prepare individuals for boot camp,

both physically and mentally. At a minimum, each recruiting station holds DEP meetings monthly. The Navy requires physical activity at each meeting. (COMNAVCRUITCOMINSTR 1133.6B) The Marine Corps highly encourages physical activity, but it is not required. The Marine Corps is the only service that requires a physical fitness test (PFT) within 30 days of joining the DEP and again before the individual is shipped to boot camp.

Some services use the DEP as a method of smoothing the flow of new trainees into the training infrastructure. DEP attrition can cause serious problems for the recruiting districts and training pipelines. Vacant seats in schools cost money, regardless if anyone attends training. The Marine Corps does not tie its accessions to school seats. Marine Corps enlistment codes allow for flexibility in assignments to handle fluctuations in accession numbers.

G. COST ESTIMATES

It is difficult to actually estimate the cost of DEP attrition. Some view DEP attrition as a natural selection process, eliminating individuals who would likely be discharged prematurely from active duty. Indeed, perhaps individuals who drop out of the DEP would have dropped out during boot camp, when the costs of replacing the recruit

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are higher. It is possible to estimate a monetary value of attrition based on the administration and manpower associated with recruitment and training. A recent GAO report calculates that, in fiscal year 1996, DoD spent about "$290 million in fixed and variable costs to recruit and train individuals who never made it to their first duty stations." (GAO/NSAID-97-39) The average cost to recruit and train an individual is approximately $12,000 (in 1997). Additionally, initial skills training can cost $6,000 to $16,000. Overall, GAO estimates that reducing 6-month attrition from active duty by 4-percent would generate a $4.8 million savings. (GAO/NSAID-97-39)

H. ATTRITION GOALS

The Army, Navy, and Air Force have recently set goals to reduce all types of unscheduled personnel attrition. The Marine Corps was the only service that did not set a goal to reduce attrition at any level. The Army's goal is to reduce early attrition by 4 percent. (GAO/NSIAD-97-39) Additionally, the Army strives to limit DEP attrition to 10 percent of gross contracts. Once an individual expresses a desire to leave the DEP, Army recruiters are instructed to "sell" the individual on the Army Reserves. (USAREC Regulation 601-95) The Marine Corps has been the most

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successful service in this respect: of those who leave the
Marine Corps DEP, 11.2 percent enlist in the Reserve or
transfer to the Inactive Ready Reserve.   (See Table 3.3 in
Chapter III.)   Although the Marine Corps has yet to set a
limit or goal regarding DEP attrition, it does recognize
that such attrition adversely affects its ability to meet
its recruiting mission. As a part of its DEP management,
Marine Corps recruiters are tasked to perform a "risk
assessment" of DEP participants. Any individual identified
as being likely to leave the DEP (based on a historical
profile) is thus given additional attention.   (MCRCO
1133.1)

I.   THESIS PURPOSE

This thesis examines the effects of personal background
characteristics and local area economic conditions on an
individual's likelihood to leave the DEP.   DEP attrition
behavior is studied over time, specifically fiscal years
1991 through 1996, and across all four military services.
Further, behavioral differences are analyzed based upon
gender and moral waiver status.   The principal method of
analysis is a binary logit model to estimate the likelihood
that an individual will attrite from the DEP.

Chapter II of the thesis presents a literature review,

which summarizes findings from previous DEP attrition research.   Chapter III discusses the data and research methodologies used in the study.   Chapter IV outlines the multivariate model estimation.   Chapter V provides logit model results.   Finally, Chapter VI presents conclusions of the study and several recommendations.

II. LITERATURE REVIEW

A. DELAYED ENTRY PROGRAM (DEP) ATTRITION RESEARCH

Since its inception in the early 1960s, many studies regarding the DEP have been published. Few studies, however, have compared DEP loss behavior among the four services. Most research in this area has used binary logit models to examine behavior within an individual service.

In 1985, Philip and Schmitz used logit models with a micro-data set to forecast DEP attrition in the U. S. Army. (Philip and Schmitz, 1985) Their data set contained all Army DEP participants from the first half of fiscal years 1982 and 1983. They analyzed one model for high school seniors and a second model for high school graduates and non-high school graduates combined. In both models, they found that a one-month increase in DEP length resulted in a 2.7 percent increase in Army DEP attrition. They also found that female and younger recruits were less likely to become DEP losses. Persons scoring higher on the Armed Forces Qualification Test (AFQT) were also less likely to become an Army DEP loss.

In 1985, Murray studied Navy DEP attrition using logit models. (Murray, 1985) She tracked all non-prior service Males who entered the Navy DEP during fiscal years 1980

through 1983 for 12 months. She found that individuals who spent more than seven months in the DEP, were over 21 years of age, and had dropped out of high school were more likely to leave the DEP. Additionally, Murray found that persons with AFQT scores above the 65th percentile were more likely to attrite. Theoretically, persons with higher AFQT scores may obtain more competitive job offers while in the DEP.

In 1986, Quester and Murray studied Navy DEP attrition using micro-level data containing all recruit cohorts from fiscal years 1983 through 1984. (Quester and Murray, 1986) The authors found "DEP attrition elasticity with respect to time-in-DEP of 1.2." That is, a 10-percent increase in months contracted in the DEP increases a person's attrition probability by 12 percent. Quester and Murray also found that women and older recruits were more likely to attrite from the DEP; and that the effects of AFQT were inconclusive. One unique feature of this study was the inclusion of shipping month, or the point at which the DEP enrollee is schedule to enter active duty. The authors found that individuals scheduled to ship in May more likely to attrite than those scheduled to ship in other months. Most high school seniors plan to ship during May and June, upon graduation. The fact that high school seniors have a

relatively high DEP loss probability may explain this peak

in DEP loss during the last spring or early summer months.

In contrast, Quester and Murray found recruits scheduled to

ship in October as least likely to leave the DEP. This may

indicate that persons who enlist from the civilian

workforce are more certain of their decision to join the

military.

Another interesting variable used by Quester and

Murray was the ratio of number of recruits in the DEP per

recruiter. As the ratio increases, the authors found that

DEP attrition increased. Logically, this suggests that

recruiters with a heavier DEP recruit load would have less

time to spend preparing each recruit for boot camp.

In 1990, Kearl and Nelson studied Army DEP attrition

as it related to the military/civilian wage ratio and

regional unemployment rates for fiscal years 1986 through

1987. (Kearl and Nelson, 1990) The authors used three

separate models: one for high school seniors, one for high

school graduates, and one for non-high school graduates.

Both the unemployment rate and the military/civilian wage

ratio were found to have significant negative effects on

DEP losses. Specifically, a 10-percent decrease in the

civilian unemployment rate was associated with a 3-percent

increase in DEP attrition. Further, a 10-percent decrease
in the military/civilian wage ratio indicated a 4.6-percent
increase in DEP attrition.

Using data from May 1987 through September 1991,
Nakada identified factors that affect Navy DEP attrition
and produced a model to forecast DEP attrition using
binary logit models. (Nakada, 1994) Individual
demographic factors have been specified in previous
studies as significantly affecting the likelihood of DEP
attrites. For example, as with Quester and Murray
(1986), Nakada found a difference of 11 percentage points
between the DEP attrition rates of men and women in the
Navy. Women tended to leave the DEP at a rate of 25
percent. At the same time, the DEP attrition rate for
men held at about 13 percent. Further, individuals in
AFQT categories I, II, and IIIA attrited at a 14.7
percent rate; and those scoring in AFQT category IIB and
IV attrited at a slightly higher rate of 16.0 percent.

As time-in-DEP increased, Nakada (1994) found an
increase in DEP attrition rates. The length of time spent
in the DEP was a significant predictor of DEP attrition.
Specifically, Nakada found that an increase of 30 days in
the DEP would tend to increase DEP attrition rates

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correspondingly by 1.4 percentage points.

Nakada (1994) separated DEP enrollees by their education status, including high school graduates, high school seniors, and non-high school graduates. High school seniors were found to comprise a disproportionate number of DEP attrites, at 53.3 percent. The DEP attrition rate for high school diploma graduates was similar to that found in previous studies, at 11.9 percent. The DEP attrition rate for high school seniors was higher than in previous studies, at 20.6 percent. As expected, seniors are most affected by civilian unemployment trends. Since seniors are usually still exploring employment opportunities, they are most open to additional information.

Nakada (1994) additionally found that older recruits were more likely to attrite than were their younger counterparts. He also found that whites had a greater propensity to attrite than did blacks. Further, Nakada found that the number of changes in shipping date was a significant predictor of DEP attrition. He argued that a change in shipping date could result in a loss of a first choice school seat.

Another interesting finding by Nakada (1994) involved the seniority of recruiters. That is, recruits with more

senior recruiters (E-7 versus E-5 or E-6) were less likely to attrite from the DEP. Recruiters are not only salesmen for the Navy, they are also role models for young recruits. Black recruiters can be unsuccessful in predominately white areas and vice versa. Nakada tracked similarities in minority characteristics of recruiters and their recruits. Statistically, these variables proved to be insignificant predictors of DEP attrition.

As expected, higher unemployment rates were found to reduce the number of DEP attrites. For example, "as the unemployment rate increases from 5.9-percent to 6.9-percent, DEP attrition rates would decrease by 2 percent." (Nakada, 1994) Nakada found that a recruit who lived farther away from a recruiting station was less likely to leave the DEP. The author surmised that applicants for enlistment from rural areas may have to seek out a recruiter, therefore demonstrating a stronger commitment to join the military than persons who have easy access to a recruiting station.

Bohn and Schmitz (1996) studied Navy recruit training and DEP attrition using Ordinary Least Squares (OLS) regression and binary logit models. Their data included a 20 percent sample of fiscal years 1992 through 1993. Navy

accessions. The authors' models separated high school
seniors from all others. They hypothesized that the
behavior of these two groups was distinctly different.
Their models indicated that individuals with higher AFQT
scores are less likely to leave the DEP. They also found
that Hispanics and older recruits more likely to attrite
from the DEP. Among women, they found that longer DEP time
corresponded with an increased likelihood of DEP attrition.

In 1998, Knox used data from Commander, Naval
Recruiting Command (CNRC) and the Center for Naval Analyses
(CNA) to analyze Navy DEP attrition behavior. (Knox, 1998)
His data set included all individuals scheduled to report
to recruit training command from October 1995 through
December 1997. Knox found "individuals who accept
incentives prior to enlistment and those individuals who
change enlistment programs while in DEP have a
significantly lower propensity to attrite from DEP than
others." The author used a Classification and Regression
Tree (CART) to analyze his logit results. According to
Knox's CART model, an individual who had no high school
diploma and a low AFQT score, who planned to spend 12
months in the DEP, had only a 3-percent chance of actually
shipping to boot camp. Knox also used a variable unseen in

previous studies: whether the individual was a cigarette smoker. His model showed that cigarette smokers had a higher propensity to attrite from the DEP.

In 1999, Henderson researched DEP attrition across services using logit models. (Henderson, 1999) Her research covered fiscal years 1990 through 1996 and used data sets from DMDC for all services, and from CNRC for Navy only. Henderson's research focused specifically on the behavior of high school seniors in the DEP. She found that older high school seniors were over 2 percentage points more likely to attrite from the DEP (5 percentage points for the Army) than were their younger counterparts. Henderson also found that the Marine Corps tended to have the highest percentage of high school seniors in the DEP as well as the highest percentage of senior DEP attrition. Further, she found that Black women tended to have the lowest DEP attrition rates. She attributed this to the relatively more limited opportunities for this group in the civilian labor market.

B. SUMMARY OF FINDINGS

Overall, researchers agree that personal characteristics (such as gender, race, and age) and economic variables (such as the local unemployment rate)

are the best predictors of DEP attrition behavior. (Nakada, 1994; Philip and Schmitz, 1985; Margaret Mary Murray, 1985; Quester and Murray, 1986; Kearl and Nelson, 1990; Bohn and Schmitz, 1996; Knox, 1998; and Henderson, 1999) Many studies also agree that the behavior of high school seniors in the DEP differs from that of persons who enlist directly from the workforce. That is, high school seniors are more likely to attrite from the DEP. (Nelson and Kearl, 1990; Bohn and Schmitz, 1996; and Henderson, 1999) Studies disagree regarding the DEP attrition behavior of individuals based on their AFQT scores. For example, Murray (1985) found that persons with higher AFQT scores tended to have a higher propensity to attrite from the DEP. Philip and Schmitz (1985), on the other hand, found that recruits with higher AFQT scores had a relatively lower likelihood of DEP attrition.

Table 2.1 summarizes the findings of previous research on DEP attrition. Eight different studies are summarized in the table. As seen here, all studies used logit models to analyze attrition behavior. Five studies focused on the Navy, two looked at the Army, and just one used data on all four services.

Table 2.1 Summary of DEP Attrition Findings from Previous Research

Study	Year	Data	Method	Findings*
Philip & Schmitz	1985	Army (FY82-83)	LOGIT Models	(+) DEP Length (-) Female (+) Age (-) AFQT score
Murray	1985	Navy (FY80-83)	LOGIT Models	(+) >7 months in DEP (+) >21 years old (+) High School Drop Out (+) >65th percentile AFQT score
Quester & Murray	1986	Navy (FY83-84)	LOGIT Models	(+) DEP Length (+) Female (+) Age (+) May Shipper (-) October Shipper (+) # of recruits in DEP per recruiter
Kearl & Nelson	1990	Army (FY86-87)	LOGIT Models	(-) Regional Unemployment Rate (-) Military/Civilian Wage Ratio
Nakada	1994	Navy (FY87-91)	LOGIT Models	(+) Female (-) AFQT Score > 50 % (+) DEP Length (+) High School Senior (+) Age (+) White (-) More senior recruiter (-) Local Unemployment Rate (-) Distance from home to Recruiting Station
Bohn & Schmitz	1996	Navy 20% of (FY92-93)	LOGIT Models	(+) High School Senior (-) AFQT Score (+) Hispanic (+) Age (+) DEP Length (+) Female
Knox	1998	Navy (1995-1997)	LOGIT Models	(-) Enlistment incentive while in DEP (-) Change in enlistment program in DEP (+) Non-High School Diploma Grad (+) Low AFQT score (+) 12 months in DEP
Henderson	1999	All Services/ High School Seniors Only (FY90-96)	LOGIT Models	(+) > 18 years old (+) Female (-) Married (+) AFQT score > 65 percentile (-) Regional Unemployment Rate (-) Black Female

*Note: (+) Positive Effect on DEP Attrition; (-) Negative Effect on DEP Attrition

III. DATA AND METHODOLOGY

A. DEP DATA FILES

The Defense Manpower Data Center (DMDC) in Monterey,
California developed a special database for this research.
A raw data file on DEP attrition initially was compiled by
DMDC at the request of the Directorate for Accession Policy
in the Office of the Under Secretary of Defense (Personnel
and Readiness). The data file contained 1.4 million
observations and included all individuals, from all four
services, who entered the DEP between October 1989 and June
1996. "Quick shippers" were not included in this data set.
(A "quick shipper" is an individual who is sent to boot
camp within the first month of enlistment.)

The Military Entrance Processing Command (MEPCOM) file
was the primary source file used in constructing the DMDC
data set. Other sources included the DMDC Active Duty
Master Loss Files, and the Defense Investigative Service
Files. Disposition status codes for personnel were used to
identify DEP attrites and were based on information from
DMDC's Active Component Files. One of three possible
status codes was assigned to each record: DEP drop, DEP
drop who later entered active duty, or DEP participant who
entered active duty.

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If an individual record contained both a DEP drop date and an active duty accession date, it was classified as a DEP drop. The existence of such a contradictory record is likely due to data entry error. In cases where the DEP entry date or DEP discharge dates were missing, but evidence of an active duty accession was determined by DMDC, the record was also classified as a DEP drop. For the purpose of this study, individuals who initially dropped from the DEP are grouped together, regardless of whether they may have reentered the DEP later (and ultimately entered active duty.)

The number of contract months in DEP was calculated by subtracting the DEP entry date from the projected date of entering active duty, as reported in the MEPCOM file. The number of actual months spent in DEP was calculated by subtracting the DEP entry date from the DEP discharge date. Particular note must be given to the disproportionate number of Air Force records with exactly 12 contract months in DEP. According to DMDC, the Air Force has indicated that this is a data reporting error.

The DMDC raw data file was converted to a Statistical Analysis System (SAS) file and merged with local unemployment data provided by the Bureau of Labor

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Statistics, Local Area Unemployment section. The Bureau
provided unemployment rates, both monthly and annual, at
the county level. The files were merged by county codes,
using SAS programs.

The final data file contains records for all
individuals who signed an enlistment contract and entered
the DEP during fiscal years 1990 through 1996. However,
local unemployment data were only available for a portion
of fiscal year 1990. Therefore, all analyses conducted in
this thesis are confined to fiscal years 1991 through 1996.

B. DESCRIPTIVE STATISTICS

Table 3.1 provides descriptive statistics for selected
variables from the data file. As seen here, Marine Corps
recruits account for about 19 percent of the sample,
compared with just under 17 percent for the Air Force. The
largest proportions of new recruits in the sample are from
the Army (34.3 percent) and the Navy (30.1 percent). Men
account for approximately 83 percent of DEP entrants in the
population. Nearly 70 percent of new DEP entrants are
white and 17 percent are black. Although the vast majority
of DEP entrants are high school graduates, high school
seniors account for the next largest education-level group
at 22.6 percent. Most individuals who entered the DEP

Table 3.1 Descriptive Statistics for DEP Data File, Fiscal Years 1991-1996

Category	Variable	Frequency (Percentage)
Service		
	Army	34.3
	Navy	30.1
	Marine Corps	18.7
	Air Force	16.9
Gender		
	Male	83
	Female	17
Dependent Status		
	No Dependents	90.0
	One or more dependent	10.0
Race		
	White	69.7
	Black	17.3
	Hispanic	8.3
	Asian, Pacific Islander or Other	4.7
AFQT Score		
	High Quality	71.1
	Low Quality	28.9
Waiver Status		
	No Waiver	83.1
	Moral Waiver	10.9
	Other Waiver	6.0
DEP Status		
	Dropped from DEP	15.0
	Entered Active Duty	85.0
DEP Entry Year		
	Fiscal Year 1991	19.1
	Fiscal Year 1992	17.9
	Fiscal Year 1993	17.7
	Fiscal Year 1994	16.4
	Fiscal Year 1995	16.8
	Fiscal Year 1996	12.1
Education Level		
	High School Graduate	70.6
	High School Senior	22.6
	GED or Non-High School Graduate	6.8
Other		
	Age at DEP Entry (years)	19.2
	Time contracted to spend in DEP (months)	6.1

between 1991 and 1996 are considered "high quality" based upon their AFQT score (Category I-IIIA), and 83 percent entered the military with no waiver. On average, DEP entrants during the period were just over 19 years old and contracted to spend about 6 months in the DEP before shipping to boot camp. It should be noted that 15 percent of all persons in the DEP data file never made it to boot camp.

C. METHODOLOGY: MULTIVARIATE LOGIT ANALYSIS

In the multivariate estimation model, the dependent variable is binary indicating whether or not an individual drops out of the DEP prior to boot camp. This binary logit model uses maximum-likelihood techniques to predict an applicant's likelihood to attrite from the DEP. The model predicts probabilities between 0 and 1.

The logit model is defined as:

$$P(Y_i) = P[Y_i = 1/X_i] = P = 1/(1+e^{-BX}),$$

where $P(Y_i)$ is the probability that individual i will become a DEP drop; B is the coefficient vector to be estimated and X is a vector of explanatory variables.

SAS was used to perform the multivariate modeling.

D. DATA TABULATIONS AND CROSS-TABULATIONS

Between FY91 and FY96, 167,134 individuals dropped out

of the DEP prior to their scheduled date to enter recruit training (see Table 1.1). Table 3.2 breaks down DEP attrition rates by gender, education-level, and service. As seen in Table 3.2, 15.2 percent of the DEP population between 1991 and 1996 dropped out of the DEP program. Although women comprise a relatively small portion of the military (14.1 percent in 1999), they experience a much higher DEP attrition rate than do men, at 21.1 percent. Men attrite from DEP at a rate closer to the overall average, 13.7 percent. Across services, the Army loses the largest number of individuals; however, the Marine Corps loses the greatest percentage of its initial DEP entrants, about 20 percent overall. At the same time, Marine Corps women experience even higher DEP attrition rates, between 27 and 30 percent. Air Force women display the lowest DEP attrition rates among servicewomen at 16 to 20 percent. Air Force men also exhibit the lowest DEP attrition rates of those in all four services, at 10 to 12 percent.

Over recent fiscal years, DEP attrition rates have remained fairly constant, varying from 10 to 20 percent for men and from 15 to 30 percent for women. It should be noted however that slightly higher DEP attrition rates are

Table 3.2 Delayed Entry Program (DEP) Attrition Rates (Percent) by Gender, Education Level, and Military Service, Fiscal Years 1991-1996

Gender and Education Level	Army	Navy	Marine Corps	Air Force	DoD
Men					
High School Senior	30.1	23.1	30.7	21.3	27.0
Non-High School Diploma Graduate	14.3	14.5	22.5	15.2	15.6
GED	13.1	11.1	15.6	13.3	12.8
Some College	9.4	13.0	14.2	11.7	11.2
High School Graduate	8.4	9.6	10.8	8.2	9.2
All Education Levels	12.6	13.4	18.3	10.6	13.7
Women					
High School Senior	47.4	36.8	47.6	36.8	41.3
Non-High School Diploma Graduate	18.6	22.0	31.2	21.0	20.5
GED	19.6	20.6	25.2	20.1	20.3
Some College	16.1	19.4	20.0	17.9	17.4
High School Graduate	15.6	17.4	19.0	15.5	16.2
All Education Levels	20.3	22.1	28.8	19.0	21.1
All					
High School Senior	33.0	25.1	31.8	25.3	29.0
Non-High School Diploma Graduate	15.1	15.5	23.0	16.6	16.4
GED	13.7	11.9	15.9	14.9	13.5
Some College	11.3	14.5	15.0	13.4	12.8
High School Graduate	9.9	10.9	11.4	10.0	10.4
All Education Levels	14.1	14.5	19.0	12.7	15.2

Source: Derived from a special database provided by the Defense Manpower Data Center.

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observed for fiscal years 1994 (16.4 percent) and 1995
(16.8 percent). High school seniors are especially prone
to leave the DEP. In fact, high school seniors who are
women experience DEP attrition at nearly 50 percent in the
Army and in the Marine Corps. Male high school seniors
leave the DEP at rates between 21 and 30 percent. Overall,
Army high school seniors leave at the greatest rate, 33
percent. Non-high school diploma graduates attrite from
the DEP at a rate of about 15 percent, which is the average
for overall DEP attrition. High school graduates
experience the lowest DEP attrition rates, at 10.5 percent.

Reasons for DEP attrition are displayed in Table 3.3.
As seen here, reasons vary greatly across gender. The most
common reason for DEP attrition for both men and women is
"refused active service, apathy or personal problem."
Between 31 and 55 percent of all individuals who attrite
from the DEP fall into this category. Among women, medical
and pregnancy reasons account for nearly 25 percent of DEP
drops. Eleven percent of men drop from the DEP for moral
reasons compared with only 3 percent for women. For men
and women, the Marine Corps kept the greatest percentage of
DEP drops in the military system. Eleven percent of men
and nearly 5 percent of women dropped out of the DEP to

enlist in the Marine Corps Reserve or the IRR. High school

seniors are ineligible to enlist if they fail to graduate

from high school. Approximately 11 to 13 percent of all

male DEP participants drop out of the DEP due to a failure

to graduate from high school. Air Force men experience the

lowest rate among all services, 3.3 percent, for failure to

graduate from high school. This reason is much less

prevalent for women. Between 2 and 6 percent of all female

DEP participants drop out of the DEP due to a failure to

graduate from high school. For men and women, between 2 to

5 percent drop out of the DEP to pursue of higher

education.

Table 3.3 Delayed Entry Program (DEP) Discharge Rates (Percent) by Gender, Reason, and Military Service, Fiscal Years 1991-1996

Gender and Discharge Reason	Army	Navy	Marine Corps	Air Force	DoD
Men					
Apathy/Personal Problem/Refused to Enlist	41.2	38.0	31.9	42.9	37.9
Medical	11.2	17.0	15.4	11.4	14.1
Moral	10.1	15.0	13.5	12.8	12.8
Failure to graduate from high school	11.6	13.4	13.8	3.3	11.8
DAT positive results	14.1	0.1	0.0	3.5	4.8
Transfer to IRR, or Enlisted in Reserve	0.0	3.7	11.2	0.6	4.3
Pursuit of higher education	4.2	3.0	3.7	1.9	3.4
Did not report to active duty	3.3	2.3	2.6	2.3	2.7
Exceeded time in DEP	1.4	1.3	0.9	2.1	1.3
Dependency disqualification	0.2	0.6	0.2	1.7	0.5
Enlisted in other service	0.1	0.8	0.5	0.8	0.5
Recruiting error/Misunderstanding	0.1	0.9	0.4	1.0	0.5
Death	0.3	0.4	0.5	0.4	0.4
Personal hardship	0.4	0.2	0.7	0.2	0.4
Disqualified for option/no alternative	0.5	0.3	0.1	1.0	0.4
Other reason	1.3	3.0	4.6	14.1	4.2
Total	100	100	100	100	100
Women					
Apathy/Personal Problem/Refused to Enlist	54.4	44.8	40.8	50.3	49.3
Medical	10.3	18.0	16.3	12.3	13.6
Pregnancy	13.2	14.1	13.2	12.5	13.3
Failure to graduate from high school	3.7	5.8	5.7	2.2	4.2
Moral	2.9	3.6	3.5	4.2	3.5
Pursuit of higher education	3.8	2.2	5.4	1.8	3.0
Did not report to active duty	3.3	2.4	3.0	1.2	2.5
Transfer to IRR, or Enlisted in same service reserve	0.0	3.6	4.7	0.4	1.6
DAT positive results	3.7	0.0	0.0	1.0	1.6
Exceeded Time in DEP	1.1	1.5	1.0	2.0	1.4
Enlisted in other service	0.1	0.9	0.5	0.4	0.4
Recruiting error/ Misunderstanding	0.0	0.7	0.4	0.6	0.4
Disqualified for option/no alternative	0.5	0.2	0.1	0.6	0.4
Death	0.1	0.1	0.1	0.2	0.1
Other reason	1.7	1.2	3.9	8.9	3.6
Total	100	100	100	100	100

Source: Derived from a special database provided by the Defense Manpower Data Center.

IV. MULTIVARIATE MODEL ESTIMATION

A. MODELS

Variations of the basic model (model 1) are used throughout this thesis. The models used in this thesis were numbered for easy reference. Table 4.1 describes each of the model specifications.

Table 4.1 Description of Models

Model	Service	Variables
1	All Services	without county unemployment rates
2	All Services	with county unemployment rates
3	Army	with county unemployment rates
4	Navy	with county unemployment rates
5	Marine Corps	with county unemployment rates
6	Air Force	with county unemployment rates
A1	All Services	high school seniors only
A2	All Services	non-high school seniors only
A3	Army	high school seniors only
A4	Army	non-high school seniors only
A5	Navy	high school seniors only
A6	Navy	non-high school seniors only
A7	Marine Corps	high school seniors only
A8	Marine Corps	non-high school seniors only
A9	Air Force	high school seniors only
A10	Air Force	non-high school seniors only

Individuals with either prior DEP experience or prior service were deleted from the sample. Approximately 4 percent of individuals were previously in the DEP and 1.7 percent were previously on active duty. The initial model included both groups, but due to high collinearity between

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the prior service and prior DEP variables, such
observations were deleted from the analysis data file.
Since local unemployment data were only available for
calendar years 1990-1998, DEP data for all of fiscal year
1990 were deleted.

B. MODEL SPECIFICATION AND HYPOTHESIZED RELATIONSHIPS

A description of variables used in the multivariate
models is displayed in Table 4.2. Models A1 through A10
are located in the Appendix. Variables selected for use in
the basic model (model 1) were chosen based upon prior
research and data availability.

The variables FEMALE and BLACK are binary, or dummy,
variables indicating whether an individual is female or
male, and black or non-black. The ethnic variable APIO
indicates whether an individual is Asian, Pacific Islander,
or other ethnicity. Women are expected to be more likely
to attrite from the DEP. Traditionally, military service
is predominately a male environment. Increased female DEP
attrition could be attributed to a lack of female role
models in the recruiting field. Pregnancy is also an
additional, disqualifying status for female DEP
participants. Blacks, Hispanics, and Asian, Pacific
Islanders are expected to be less likely to attrite from

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Table 4.2 Description of Model Variables

Variable	Description
Service	
ARMY	=1 if Army; =0 if otherwise
NAVY	=1 if Navy; =0 if otherwise
MARINE	=1 if Marine Corps; =0 if otherwise
AIRFORCE	=1 if Air Force; =0 if otherwise
Gender	
FEMALE	=1 if female; =0 if male
Dependent Status	
DEPEND	=1 if one or more dependents; =0 if no dependents
Race	
BLACK	=1 if Black; =0 if otherwise
HISP	=1 if Hispanic; =0 if otherwise
APIO	=1 if Asian, Pacific Islander or other; =0 if otherwise
AFQT Score	
LOWQUAL	=1 if AFQT score is IIIB or IV; =0 if AFQT score is Category I, II, or IIIA
Waiver Status	
MORALWVR	=1 if granted Active Duty or DEP Moral Waiver; =0 if no waiver
OTHERWVR	=1 if granted Active Duty or DEP waiver other than a moral waiver; =0 if no waiver
DEP Status	
ALLDROP	=1 if dropped out of the DEP; =0 if shipped to basic training
DEP Entry Year	
FY91	=1 if entered DEP in Fiscal Year 1991; =0 if otherwise
FY92	=1 if entered DEP in Fiscal Year 1992; =0 if otherwise
FY93	=1 if entered DEP in Fiscal Year 1993; =0 if otherwise
FY94	=1 if entered DEP in Fiscal Year 1994; =0 if otherwise
FY95	=1 if entered DEP in Fiscal Year 1995; =0 if otherwise
FY96	=1 if entered DEP in Fiscal Year 1996; =0 if otherwise
Education Level	
HSGRAD	=1 if High School Graduate; =0 if otherwise
HSSENIOR	=1 if High School Senior; =0 if otherwise
GED_NHSG	=1 if GED certificate or non-high school graduate; =0 if otherwise
Other	
AGE_DEP	Age at DEP Entry (years)
MNS_DEP	Time contracted to spend in DEP (months)

DEP. In theory, minorities may have fewer employment or other opportunities outside the military. The variable DEPEND includes individuals who are married or unmarried with dependents at the time of DEP entry. Individuals with dependents may have a stronger desire for employment than those without such responsibilities. Therefore, persons with dependents are expected to be less likely to attrite from the DEP.

The AGE_DEP variable indicates an individual's age (in years) at the time of DEP entry. The military will not accept applicants for enlistment who are older than 35 years. The primary window of opportunity for enlistment is for persons who are ages 17 to 21 years old. Historically, older recruits may be less suited for military service due to physical abilities and trainability. Prior research shows that older recruits are more likely to attrite from both basic training and the DEP. (Quester and Murray, 1986; Nakada, 1994; and Bohn and Schmitz, 1996)

The MNS_DEP variable shows the number of months that an individual contracted to spend in the DEP. The longer a recruit intends to spend in the DEP, the increased chance that other opportunities of employment may occur. Therefore, it is expected that MNS_DEP will have a positive

effect on DEP attrition.

Individuals were placed in one of three different education level categories: high school senior (HSSENIOR), high school graduate/some college (HSGRAD), and GED/non-high school graduate (GED_NHSG). Each of the three education level variables is measured as a binary variable. Prior research has proven that high school seniors are more likely to attrite from the DEP. High school seniors typically join the DEP for longer periods, thus finding more opportunities (theoretically) for employment. Additionally, individuals with GEDs and high school drop-outs are also more likely to attrite from the DEP. Perhaps these individuals are prone to attrite from any occupation.

Individuals scoring in AFQT category IIIB were placed in the low quality category (LOWQUAL). High quality includes individuals scoring in AFQT category I, II, or IIIA. The military limits the number of enlistment opportunities for persons who score in the low quality category. Although these individuals may likewise have limited employment opportunities outside the military, they may be prone to other disqualifying factors, such as misconduct or failure to graduate from high school.

For individuals who require either a DEP moral waiver

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or an active duty moral waiver, MORALWVR equals 1. Moral

waivers may be granted for traffic violations, felony

convictions, drug or alcohol abuse, or misdemeanor

offenses. Moral waivers are defined differently across

services. For example, the Navy and the Air Force define a

felony-type moral waiver as one or more felony-type

offenses. The Marine Corps and the Army limit the number

of allowable felony-type convictions to one. (GAO/NSAID -

99-53) Individuals with moral waivers are expected to be

more likely to attrite from the DEP. Typically, behavior

warranting a moral waiver is not consistent with the

military lifestyle. This "mismatch" may result in DEP

attrition.

Differences in moral waiver regulations across

services require that these differences be controlled in

all-service models. Therefore, in models 1 and 2, separate

dummy variables (ARMY, MARINE and AIRFORCE) are entered for

each branch. NAVY is the omitted category. Since policies

may change over time, and accessions are normally counted

within fiscal years, dummy variables are used to control

for each fiscal year. Fiscal year dummies also capture any

cohort effects that may be present in the data.

Specifically, the following dummy variables represent an

individual's fiscal year (FY) of DEP entry: FY91, FY92,
FY93, FY94, FY95, or FY96. Fiscal year 1991 is omitted
from the model, as the base-case year.

A county level unemployment rate, (UR2), was assigned
to each DEP participant based upon the month and year of
DEP entry and the individual's home of record county. The
assumption is that individuals who enlist in the military
initially choose it over their civilian employment
alternatives. While serving in the DEP at home, however,
they may seek and find better civilian jobs and thus
experience "decision reversal." The county is assumed to
be the relevant local labor market where job search occurs.
This assumption is less tenable in major metropolitan areas
where job seekers may search over several nearby urban
counties. Counties with lower unemployment rates are
expected to experience more decision reversals, because
individuals who continue their job search have a higher
probability of finding a better civilian job.

In summary, based on previous research, the following
variables are predicted to have a positive effect on DEP
attrition (that is, increase an individual's likelihood to
become a DEP loss): FEMALE, MNS_DEP, AGE_DEP, LOWQUAL,
GED_NHSG, HSSENIOR, and MORALWVR. The following variables

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are predicted to have a negative effect on DEP attrition
(that is, decrease an individual's likelihood to become a
DEP loss): BLACK, HISP, APIO, UR2, and DEPEND.

C. ISSUES WITH UNEMPLOYMENT RATE DATA

The BLS unemployment rate data files were missing
information on some counties for some months, which reduced
the number of observations for estimate of the multivariate
models. A second problem is that numerous county codes
were missing in the DMDC data set, and county codes were
used to merge the two data sets. In model 1, the all-
services model that excluded local area unemployment rate,
there were 39,400 missing observations for various reasons.
When the same all-services model was estimated with local
area unemployment rates (model 2), there were 135,194
missing observations (about 10.3 percent of the total
sample). To determine whether the additional missing
observations were random, and whether the available
analysis data file was representative of the population,
the means the variables used in models 1 and 2 were
compared. This comparison is shown in Table 4.3.

As seen in Table 4.3, the means in model 1 and model 2
are nearly identical. By omitting local area unemployment
rate from the model specification, the model risked an

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omitted variable bias due to the importance of economic

factors to an individual's decision. By including

unemployment data, the model loses approximately 14 percent

of its observations. Considering that the data set

contains over 1 million observations, and the additional

missing observations are representative of the whole

sample, all models in this thesis include the local area

unemployment variable.

Table 4.3 Variable Means for Models 1 and 2

Variable	N1	N2	Mean1	Mean2	StdDev1	StdDev2
FEMALE	1100874	1001701	0.171	0.171	0.376	0.377
BLACK	1100874	1001701	0.171	0.174	0.376	0.379
HISP	1100161	1001054	0.084	0.081	0.277	0.273
APIO	1100161	1001054	0.047	0.047	0.212	0.212
ARMY	1100874	1001701	0.341	0.340	0.474	0.474
MARINE	1100874	1001701	0.188	0.188	0.391	0.390
AIRFORCE	1100874	1001701	0.171	0.171	0.377	0.376
DEPEND	1100874	1001701	0.100	0.101	0.300	0.302
AGE_DEP	1100874	1001701	19.242	19.219	2.263	2.243
MNS_DEP	1087543	989575	6.072	6.061	4.083	4.079
HSSENIOR	1100874	1001701	0.227	0.230	0.419	0.421
GED_NHSG	1100874	1001701	0.067	0.067	0.250	0.250
LOWQUAL	1073422	976584	0.286	0.287	0.452	0.452
MORALWVR	1100874	1001701	0.108	0.108	0.310	0.311
FY92	1100874	1001701	0.179	0.180	0.384	0.384
FY93	1100874	1001701	0.177	0.178	0.382	0.383
FY94	1100874	1001701	0.164	0.164	0.370	0.370
FY95	1100874	1001701	0.168	0.166	0.374	0.372
FY96	1100874	1001701	0.121	0.121	0.327	0.326
UR2	-----------	1001701	--------	6.793	--------	2.991
ALLDROP	1100874	1001701	0.150	0.151	0.357	0.358
DEPDROP	1100874	1001701	0.136	0.137	0.343	0.344
REENTER	1100874	1001701	0.014	0.014	0.117	0.117

Source: Derived from a special database provided by the Defense Manpower Data Center.

D. SPECIFICATION OF BASIC MODEL

The basic model was specified as follows:

$$
\begin{aligned}
\text{ALLDROP} = {} & \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{BLACK}) + \beta_3(\text{HISP}) \\
& + \beta_4(\text{APIO}) + \beta_5(\text{DEPEND}) + \beta_6(\text{AGE\_DEP}) + \beta_7(\text{MNS\_DEP}) \\
& + \beta_8(\text{HSSENIOR}) + \beta_9(\text{GED\_NHSG}) + \beta_{10}(\text{LOWQUAL}) + \beta_{11}(\text{MORALWVR}) \\
& + \beta_{12}(\text{FY92}) + \beta_{13}(\text{FY93}) + \beta_{14}(\text{FY94}) + \beta_{15}(\text{FY95}) + \beta_{16}(\text{FY96}) + \beta_{17}(\text{UR2}) \\
& + \beta_{18}(\text{ARMY}) + \beta_{19}(\text{MARINE}) + \beta_{20}(\text{AIRFORCE});
\end{aligned}
$$

where all variables were defined above in Table 4.2.

E. INTERPRETING MODEL RESULTS

Model results provide estimates of the coefficients (β's) called parameter estimates. Each parameter estimate has an accompanying standard error. The significance is determined by evaluating the chi-square value. An asterisk on each table indicates variables that are statistically significant and the level of significance.

The results of the logit model provide useful information on the relationship between various demographic and economic factors and the probability that an individual drops out of the DEP. The estimated coefficients (β's) from the multivariate mode can be used to compute marginal effects. The marginal effect of each independent variable

quantifies the magnitude of the effect of that variable on the probability of DEP attrition. For example, a logit marginal effect of .14 associated with the binary variable BLACK would indicate that a black recruit was 14 percentage points more likely than the base-case individual to become a DEP loss. The base-case individual is used to develop the baseline probability of attrition. The base-case is defined as a single, white man of average age in Table 4.4.

Table 4.4 Description of the Base-Case Individual

Variable	Description
Service	Navy (for all service models)
Gender	Male
Dependent Status	No dependents
Race	White
AFQT Score	Category I, II or IIIA
Waiver Status	No DEP or active duty waivers
DEP Entry Year	Fiscal Year 1991
Education Level	High School Graduate
DEP Entry Age	Average for model sample; Varies with each model
Contract months in DEP	Average for model sample; Varies with each model

V. LOGIT MODEL RESULTS

A. ALL-SERVICE MODEL WITHOUT UNEMPLOYMENT RATES (MODEL 1)

Results of model 1 are shown in Table 5.1. Each of the variables in the all-service model (model 1) proved to be significant at the .01 level. The variables included here were selected based solely upon previous research. The largest partial effect is produced by the variables HSSENIOR. A high school senior is 133 percent more likely to become a DEP loss than the base-case individual. The MORALWVR variable produced an unexpected sign. A person entering the DEP with a moral waiver is 4.2 percentage points less likely to become a DEP loss. The next largest parameter estimate is for AIRFORCE enlistees. An airman in the DEP is 6 percentage points less likely to attrite from the DEP than the omitted, base-case (Navy). Translated into a percentage, an airman is 58 percent less likely to attrite from the DEP than is a sailor.

The variable FEMALE produced a high marginal effect. A female with the same characteristics are the base-case individual is 8.5 percentage points more likely to become a DEP loss (which is 83 percent more likely to drop from the DEP). There also appears to be either a trend in DEP

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Table 5.1 All-Service DEP Attrition LOGIT Model
Without County-level Unemployment Rates
(Model 1)

Variable	Parameter Estimate		Standard Error	Marginal Effect $=(\Delta P/\Delta X)$	Percentage Effect $=(\Delta P/\Delta X \div P)$
INTERCEPT	-5.542		0.034		
FEMALE	0.704	*	0.007	0.085	0.831
BLACK	-0.099	*	0.008	-0.009	-0.085
HISP	-0.037	*	0.011	-0.003	-0.033
APIO	-0.077	*	0.014	-0.007	-0.067
DEPEND	-0.287	*	0.012	-0.024	-0.230
AGE_DEP	0.126	*	0.002	0.012	0.119
MNS_DEP	0.156	*	0.001	0.015	0.148
HSSENIOR	1.006	*	0.007	0.135	1.322
GED_NHSG	0.405	*	0.012	0.044	0.426
LOWQUAL	0.053	*	0.007	0.005	0.049
MORALWVR	-0.581	*	0.012	-0.042	-0.414
FY92	-0.103	*	0.009	-0.009	-0.089
FY93	-0.005		0.009	-0.000	-0.005
FY94	0.036	*	0.010	0.003	0.033
FY95	-0.097	*	0.010	-0.009	-0.084
FY96	-0.375	*	0.013	-0.030	-0.290
ARMY	0.104	*	0.008	0.010	0.097
MARINE	0.196	*	0.008	0.019	0.190
AIRFORCE	-0.943	*	0.011	-0.060	-0.585

N=1,061,494

-2 Log L =776,671

Chi-square = 84,355 (d.f.=19) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

attrition or significant cohort effects, as the negative coefficients for fiscal years 1995 and 1996 are much larger than for earlier years.

B. ALL-SERVICE MODEL WITH COUNTY-LEVEL UNEMPOYMENT RATES (MODEL 2)

The results of estimating the all-service model with the unemployment rates are displayed in Table 5.2. Only HISP and FY93 proved to be insignificant at the .01 level. As in model 1, the largest marginal effect was produced by the variable HSSENIOR. A high school senior is 13.2 percentage points more likely to attrite from the DEP. In other terms, this person is 128 percent more likely to become a DEP drop. Separate models for high school seniors and non-high school seniors were used based upon the results of likelihood ratio tests. (see Appendix) The variable MORALWVR produced an unexpected sign. An individual with a moral waiver is 41 percent less likely to attrite from the DEP. When the county unemployment rate increases by 1 percentage point, (a 15-percent change), the probability of DEP loss increases by 10 percent. This yields an elasticity of DEP loss with respect to the unemployment rate of -.66. As noted previously, the number of missing observations increased significantly in model 2

compared with model 1.

Table 5.2 All-Service DEP Attrition LOGIT Model With County-level Unemployment Rates (Model 2)

Variable	Parameter Estimate		Standard Error	Marginal Effect $=(\Delta P/\Delta X)$	Percentage Effect $=(\Delta P/\Delta X \div P)$
INTERCPT	-5.443		0.037		
FEMALE	0.713	*	0.008	0.087	0.843
BLACK	-0.103	*	0.009	-0.009	-0.089
HISP	-0.016		0.012	-0.001	-0.014
APIO	-0.090	*	0.015	-0.008	-0.078
DEPEND	-0.282	*	0.012	-0.023	-0.227
AGE_DEP	0.126	*	0.002	0.012	0.118
MNS_DEP	0.156	*	0.001	0.015	0.149
HSSENIOR	0.983	*	0.008	0.132	1.280
GED_NHSG	0.414	*	0.013	0.045	0.437
LOWQUAL	0.058	*	0.007	0.005	0.053
MORALWVR	-0.580	*	0.012	-0.043	-0.414
FY92	-0.091	*	0.010	-0.008	-0.079
FY93	0.002		0.010	0.000	0.001
FY94	0.032	*	0.010	0.003	0.029
FY95	-0.102	*	0.010	-0.009	-0.088
FY96	-0.385	*	0.013	-0.031	-0.296
UR2	-0.012	*	0.001	-0.001	-0.010
ARMY	0.101	*	0.008	0.010	0.094
MARINE	0.194	*	0.009	0.019	0.188
AIRFORCE	-0.938	*	0.011	-0.060	-0.583

N=965,701
-2 Log L = 708,167
Chi-square = 76,471 (d.f.=19) (p=.0001)
*Significant at the .01 level

C. SERVICE-SPECIFIC LOGIT MODELS (MODELS 3-6)

Tables 5.5 through 5.8 show the results of individual service DEP attrition LOGIT models (Models 3-6). A summary of marginal effects for all individual services is shown in Table 5.9. Most variables in all models are significant at the .05 level or greater. A few variables produced unexpected signs in models 5-8. As in models 1 and 2, MORALWVR produced an unexpected negative sign. An individual who enters the DEP with a moral waiver or who attains a moral waiver while in the DEP is 2 to 9 percentage points less likely to drop out of the DEP. Prior research findings have found both positive and negative effects associated with waiver variables. (Henderson, 1999) The marginal effect for MORALWVR is highest in the Marine Corps model, nearly five times greater than that of the Army model. An individual in the Marine Corps DEP with a moral waiver is 63 percent less likely to attrite from the DEP than is someone in the Marine Corps DEP without a moral waiver. This is counter-intuitive. Of all the services, the Marine Corps has the highest proportion of individuals who enter the DEP with a moral waiver. Perhaps this is due to the service's strict

requirements concerning the types of offenses that require
a moral waiver.

The variable HISP produced an unexpected positive sign
in the Navy model; however, HISP was insignificant. The
variable APIO produced an unexpected positive sign in the
Marine Corps model at a .05 significance level. This
indicates that Navy Hispanics are generally more likely to
attrite from the DEP. Hispanics in the Marine Corps DEP
are .5 percentage points less likely to attrite from the
DEP. The marginal effects of both APIO and HISP are
relatively small. Therefore, a sign change is not too
surprising.

Marine Corps women are 10.5 percentage points more
likely to attrite from DEP than are Marine Corps men. This
is the largest marginal effect for gender among the
services. Women in the Army experience the smallest
marginal effect, at 6.7 percentage points. This finding is
consistent with prior research. (Philip and Schmitz,
1985; Quester and Murray, 1986; Nakada, 1994; Bohn and
Schmitz, 1996; and Henderson, 1999)

DEPEND produced expected results across services. An
individual who enters the DEP with a dependent is 1 to 3
percentage points less likely to attrite from the DEP.

This finding is consistent with prior research. (Kearl and Nelson, 1992; Henderson, 1999)

The variable LOWQUAL has an inconsistent impact upon an individual's likelihood to attrite from the DEP across all services. This variable is significant only for the Army and Navy models. For the Army model, an individual who scores below the 64th percentile on the AFQT is 19 percent more likely to attrite from the DEP. The same individual in the Navy DEP is only 8 percent more likely to attrite from the DEP. This finding concurs with some prior research. (Murray, 1985; Philip and Schmitz, 1985; Bohn and Schmitz, 1996; Knox, 1998; and Henderson, 1999) However, it contradicts findings in another study. (Nakada, 1994)

The amount of time contracted to spend in the DEP proved to be significant across all services. Moreover, the marginal effect of this variable is relatively constant for all models. Each additional month contracted to spend in the DEP increases the likelihood that an individual will attrite from the DEP by approximately 1.5 percentage points. This finding is consistent with prior research. (Philip and Schmitz, 1985; Murray, 1985; Quester and Murray, 1986; Kearl and Nelson, 1990; Nakada, 1994; Bohn and Schmitz, 1996; Knox, 1998; and Henderson, 1999)

Education level variables, GED_NHSG and HSSENIOR, were significant in models 1 through 6. Both GED_NHSG and HSSENIOR had the largest percentage effects in the Marine Corps model. Specifically, a high school senior in the Marine Corps DEP is 122 percent more likely to attrite from the DEP than a Marine Corps high school graduate. This finding is consistent with prior research. (Murray, 1985; and Knox, 1998)

The variable AGE_DEP has a positive effect on DEP attrition across services. Individuals who are one year older than average (base-case) are 1 to 2 percentage points more likely to attrite from the DEP. This finding is consistent with prior research. (Murray, 1985; Nakada, 1994; Bohn and Schmitz, 1996; and Henderson, 1999)

The variables that control for differences in DEP behavior between fiscal years indicate a slight upward trend in DEP attrition. Individuals who entered the Army DEP in fiscal year 1996 are 2.3 percentage points less likely to attrite from DEP that those who entered in 1991; whereas individuals who entered the DEP in 1992 through 1994 are only .3 to 1.4 percentage points more likely to attrite from the DEP. This trend also appears in the Air Force model. In the Navy model 1992 through 1994 variables are not significant, but the DEP attrition rate is 2.5

point higher in 1996. The Marine Corps model indicates that DEP attrition increases until 1995, but there is no difference in 1996.

The county-level unemployment variable proved to be significant across all services. When the county-level unemployment rate increases by 1 percentage, the probability of DEP loss increases by .1 percentage point. Although the impact of county-level unemployment is relatively small, the results are consistent with findings of prior research. (Kearl and Nelson, 1994; and Henderson, 1999)

Note that the unemployment rate is measured as of the individual's month of entry into the DEP. No attempt is made to examine DEP stay-loss decisions longitudinally. Since civilian unemployment is known to be an important factor in motivating a person to enlist, it is likely that the coefficient of the unemployment rate is biased downward. An analysis of month-to-month changes in local unemployment rates on DEP participants' stay-leave decisions would provide a more accurate indicator of the strength of unemployment on DEP loss decisions.

Table 5.3 Army DEP Attrition LOGIT Model
(Model 3)

Variable	Parameter Estimate		Standard Error	Marginal Effect =(ΔP/ΔX)	Percentage Effect =(ΔP/ΔX ÷P)
INTECEPT	-6.3560		0.0618		
FEMALE	0.7223	*	0.0131	0.067	0.911
BLACK	-0.0323	**	0.0144	-0.002	-0.029
HISP	-0.0087		0.0234	-0.001	-0.008
APIO	-0.1208	*	0.0296	-0.008	-0.106
DEPEND	-0.3335	*	0.0197	-0.020	-0.268
AGE_DEP	0.1528	*	0.0028	0.011	0.151
MNS_DEP	0.2066	*	0.0021	0.015	0.209
HSSENIOR	1.1435	*	0.0146	0.126	1.712
GED_NHSG	0.3712	*	0.0207	0.030	0.403
LOWQUAL	0.1897	*	0.0136	0.014	0.191
MORALWVR	-0.2913	*	0.0292	-0.018	-0.239
FY92	0.0052		0.0187	0.000	0.005
FY93	0.0440	*	0.0180	0.003	0.042
FY94	0.1849	*	0.0183	0.014	0.185
FY95	-0.0473	*	0.0184	-0.003	-0.043
FY96	-0.4060	*	0.0235	-0.023	-0.317
UR2	-0.0053	*	0.0020	-0.000	-0.005

N=327,104

-2 Log L = 219,124

Chi-square = 33,939 (d.f.=17) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 5.4 Navy DEP Attrition LOGIT Model
(Model 4)

Variable	Parameter Estimate		Standard Error	Marginal Effect $=(\Delta P/\Delta X)$	Percentage Effect $=(\Delta P/\Delta X \div P)$
INTECEPT	-5.5700		0.0645		
FEMALE	0.7470	*	0.0137	0.087	0.907
BLACK	-0.0678	*	0.0152	-0.006	-0.060
HISP	0.0125		0.0189	0.001	0.011
APIO	-0.1523	*	0.0277	-0.012	-0.129
DEPEND	-0.1201	*	0.0224	-0.010	-0.103
AGE_DEP	0.1338	*	0.0029	0.012	0.128
MNS_DEP	0.1598	*	0.0019	0.015	0.154
HSSENIOR	0.7558	*	0.0138	0.088	0.921
GED_NHSG	0.3958	*	0.0223	0.039	0.407
LOWQUAL	0.0836	*	0.0123	0.007	0.078
MORALWVR	-0.3588	*	0.0172	-0.027	-0.281
FY92	-0.0294		0.0166	-0.003	-0.026
FY93	-0.0284		0.0177	-0.002	-0.025
FY94	-0.0094		0.0186	-0.001	-0.008
FY95	-0.0478	**	0.0190	-0.004	-0.042
FY96	-0.3301	*	0.0250	-0.025	-0.261
UR2	-0.0162	*	0.0020	-0.001	-0.015

N=293,176
-2 Log L = 219,631
Chi-square = 19,687 (d.f.17) (p=.0001)
* Significant at the .01 level
** Significant at the .05 level

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Table 5.5 Marine Corps DEP Attrition LOGIT Model
(Model 5)

Variable	Parameter Estimate		Standard Error	Marginal Effect $=(\Delta P/\Delta X)$	Percentage Effect $(\Delta P/\Delta X \div P)$
INTECEPT	-5.309		0.097		
FEMALE	0.677	*	0.023	0.105	0.727
BLACK	-0.135	*	0.020	-0.016	-0.110
HISP	-0.043	**	0.022	-0.005	-0.036
APIO	0.056	**	0.027	0.007	0.049
DEPEND	-0.218	*	0.033	-0.025	-0.172
AGE_DEP	0.152	*	0.005	0.019	0.135
MNS_DEP	0.120	*	0.002	0.015	0.107
HSSENIOR	1.029	*	0.016	0.176	1.224
GED_NHSG	0.660	*	0.030	0.101	0.706
LOWQUAL	-0.022		0.014	-0.003	-0.019
MORALWVR	-1.101	*	0.024	-0.091	-0.632
FY92	-0.299	*	0.022	-0.033	-0.230
FY93	-0.153	*	0.021	-0.018	-0.124
FY94	-0.137	*	0.021	-0.016	-0.112
FY95	-0.233	*	0.022	-0.026	-0.183
FY96	-0.319	*	0.026	-0.035	-0.244
UR2	-0.009	*	0.002	-0.001	-0.007

N=180,866

-2 Log L = 153,521

Chi-square = 15,883 (d.f.=17) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 5.6 Air Force DEP Attrition LOGIT Model
(Model 6)

Variable	Parameter Estimate		Standard Error	Marginal Effect $=(\Delta P/\Delta X)$	Percentage Effect $(\Delta P/\Delta X \div P)$
INTECEPT	-4.795		0.102		
FEMALE*	0.729	*	0.017	0.082	0.889
BLACK*	-0.356	*	0.025	-0.026	-0.280
HISP**	-0.074	**	0.038	-0.006	-0.065
APIO*	-0.180	*	0.041	-0.014	-0.152
DEPEND*	-0.412	*	0.030	-0.029	-0.316
AGE_DEP*	0.056	*	0.004	0.005	0.052
MNS_DEP*	0.146	*	0.004	0.013	0.141
HSSENIOR*	1.134	*	0.020	0.148	1.601
GED_NHSG*	0.326	*	0.045	0.031	0.338
LOWQUAL	0.003		0.021	0.000	0.002
MORALWVR*	-0.771	*	0.049	-0.047	-0.513
FY92*	-0.142	*	0.026	-0.011	-0.121
FY93*	0.080	*	0.025	0.007	0.075
FY94**	-0.059	**	0.025	-0.005	-0.052
FY95*	-0.332	*	0.027	-0.024	-0.263
FY96*	-0.799	*	0.036	-0.049	-0.526
UR2*	-0.019	*	0.003	-0.002	-0.017

N=164,555

Missing Observations=24,239

-2 Log L =111,171.950

Chi-square = 9,336.528 with 17 degrees of freedom (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 5.7 Summary of Marginal Effects for DEP Attrition LOGIT Models for All Services (Models 3-6)

Variable	Army (Model 3)		Navy (Model 4)		Marine Corps (Model 5)		Air Force (Model 6)	
FEMALE	0.067	*	0.087	*	0.105	*	0.082	*
BLACK	-0.002	**	-0.006	*	-0.016	*	-0.026	*
HISP	-0.001		0.001		-0.005	**	-0.006	**
APIO	-0.008	*	-0.012	*	0.007	**	-0.014	*
DEPEND	-0.020	*	-0.010	*	-0.025	*	-0.029	*
AGE_DEP	0.011	*	0.012	*	0.019	*	0.005	*
MNS_DEP	0.015	*	0.015	*	0.015	*	0.013	*
HSSENIOR	0.126	*	0.088	*	0.176	*	0.148	*
GED_NHSG	0.030	*	0.039	*	0.101	*	0.031	*
LOWQUAL	0.014	*	0.007	*	-0.003		0.000	
MORALWVR	-0.018	*	-0.027	*	-0.091	*	-0.047	*
FY92	0.000		-0.003		-0.033	*	-0.011	*
FY93	0.003	*	-0.002		-0.018	*	0.007	*
FY94	0.014	*	-0.001		-0.016	*	-0.005	**
FY95	-0.003	*	-0.004	**	-0.026	*	-0.024	*
FY96	-0.023	*	-0.025	*	-0.035	*	-0.049	*
UR2	-0.000	*	-0.001	*	-0.001	*	-0.002	*

* Significant at the .01 level
** Significant at the .05 level

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VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

Several findings emerged from the study of DEP attrition. Major results of statistical analyses include the following:

- Gender and educational level were found to have a strong effect on the attrition behavior of individuals in the DEP. Specifically, recruits who are high school seniors tend to have the highest DEP attrition rates. Further, a likelihood ratio test was used to determine that separate models are required for high school seniors and non-high school seniors.

- Women tend to be 6 to 10 percentage points more likely than are men to leave the DEP.

- Across services, the Marine Corps experiences the highest DEP attrition rates for both men and women.

- County-level unemployment rates had a significant, but small, negative effect on DEP attrition. That is, an increase in the unemployment rate results in a decrease in the DEP attrition rate.

- The longer a person spends in the DEP, the more likely he or she will leave the DEP prior to basic training.

- Recruits who have dependents at the time of DEP entry are less likely than those who do not have dependents to leave the DEP.

- Across services, participants who are black tend to be less likely to leave the DEP.

- Persons whose ethnic origin is Asian or Pacific Islander are less likely to attrite from the DEP, except for those in the Marine Corps.

- Hispanic ethnicity was found to have a negative impact on DEP attrition in the Marine Corps and Air Force. That is, a Hispanic recruit in the Marine Corps or Air Force DEP is less likely to leave than is a non-Hispanic recruit.

- Across services, individuals with a moral waiver tend to be less likely to attrite from the DEP than are those without a moral waiver.

- Most individuals who leave the DEP (32 to 55 percent), do so for "apathy, personal problems or refusal to enlist" (official categories in DEP documentation).

B. CONCLUSIONS

Most of the findings in this study concur with those of prior research. For example, as in previous studies of DEP attrition, women were found to leave the DEP at rates much higher than those of men. About 50 percent of women drop out of the DEP for the stated reasons of "apathy, personal problems, or refusal to enlist." According to the Youth Attitude Tracking Study in 1992, women also have a much lower propensity to enlist than do men. (Perry, 1996) Perhaps, women who enter the DEP are less sure of their decision to enlist, and therefore less likely to remain in the DEP. Additionally, 12 to 14 percent of women leave the DEP because of pregnancy.

As previously noted, high school seniors attrite from the DEP at rates that are much higher than those of non-high school seniors. While finishing high school, high school seniors may decide against military service as other employment opportunities become available. Also, opportunities to pursue higher education may arise while high school seniors wait in the DEP. Further, the longer high school seniors spend in the DEP, the greater the chance that other individuals may influence their decision to leave the DEP.

On average, individuals spend about 6 months in the
DEP. Many previous studies have determined that the longer
an individual spends in the DEP, the more likely he or she
is to drop out. Each service has different DEP management
policies regarding contact requirements between DEP
participants and recruiters. Despite differing policies,
the effect of time in DEP remains nearly constant across
services. For example, although Army recruiters increase
their contact with DEP participants 45 days before they
ship to boot camp, the Army still experiences DEP attrition
rates that are roughly similar to those of other services.

Previous studies have found significant, negative
effects of unemployment rates on DEP attrition. Most
researchers would agree that unemployment rates at the time
of DEP entry are a likely influence on decisions to join
the military. The present study used county-level
unemployment data that were not specifically tied to
periods of DEP departure. A more accurate determinant of
DEP attrition may be unemployment rates at the time that an
individual drops out of the DEP. Previous studies have
used regional unemployment rates. (Kearl and Nelson, 1990;
and Henderson, 1999) As previously noted, this study used
county-level unemployment rates in DEP attrition models.
If youth seek employment outside their own county when

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considering employment opportunities, perhaps metropolitan-area or regional unemployment rates may be a more accurate determinant of DEP attrition.

One of the results in the present study differs from that of previous research. Across services, individuals with either a DEP moral wavier or an active-duty moral waiver were found to be less likely to leave the DEP. These results are consistent with Henderson's research; however, it should be noted that she used the same database and only studied high school seniors. (Henderson, 1999) Nevertheless, the results regarding moral waivers are counter-intuitive, since first-term attrition for recruits who have a moral waiver is typically much higher than for others. (Flyer, 1995; and Flyer, 1996) If persons with a moral waiver are so consistently more likely to leave during their first term of active-duty service, it should follow that they are also more likely than others to leave the DEP.

One explanation for this unexpected result regarding moral waivers may be corruption of the data. The Marine Corps has yet another explanation for this unexpected result. The Marine Corps generally screens individuals requiring a moral waiver for enlistment more closely than it screens other applicants. A moral waiver package must

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be prepared for each case. This package includes
significant documentation, including personal letters of
referral. Any individual who applies for enlistment, but
is required to have a moral waiver, must usually exhibit
other positive, compensating qualifications, which are
documented in the waiver package. If enough qualified
individuals seek enlistment, Marine Corps recruiters have
leeway to be more restrictive when considering individuals
who need a moral waiver. According to authorities in the
Marine Corps, since DEP enrollees with a moral waiver are
required to demonstrate that they are highly qualified in
other ways, their relatively stronger qualifications may
make them less likely to leave the DEP.

As previously noted, the present study found that a
majority of persons who leave the DEP do so for the stated
reasons of "apathy, personal problems, or refusal to
enlist." It is clear that these reasons are hardly
descriptive enough to allow for detailed research regarding
the causes of attrition. After all, what is actually meant
by "refusal to enlist"? Why, precisely, did the individual
refuse to enlist? The DEP discharge codes in the official
documentation are too vague and may not accurately indicate
the true reason why a recruit leaves the DEP. Currently,
the form that captures this reason allows for the selection

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of only one coded entry. In reality, a person may leave

the DEP for a variety of reasons; yet, recruiting personnel

are limited to assign a single reason for a DEP loss.

Additionally, an individual who simply does not want to go

to boot camp may be classified differently by each service.

The Army may classify this individual as having a "personal

problem," whereas the Marine Corps may classify this

individual simply as "refused active service."

C. RECOMMENDATIONS

The stated reasons why individuals leave the DEP, as

provided in official forms, are too vague for proper

analyses. As noted, administrative forms only allow for

entry of a single reason as to why an individual drops out.

New administrative forms that capture multiple drop codes

could provide for improved analyses of the reasons for DEP

attrition. Furthermore, recruiters may be reluctant to

show a drop category that places blame for a DEP loss on

the recruiter as opposed to the DEP participant. If a

recruit leaves for "apathy," the recruiting command may

view this as a leadership failure of the recruiter. One

way to capture the true reason why an individual leaves the

DEP is to conduct a personal, exit interview as soon as

possible with the person after he or she drops out.

High school seniors have a very high rate of DEP attrition; however, it is difficult to deal with this situation until one can determine more accurately the reasons as to why seniors are leaving the DEP. Limiting enlistments by high school seniors may reduce DEP attrition, but such action would obviously affect the ability of recruiters to meet their recruiting goals. Apparently, a number of high school seniors are forced to leave the DEP for failure to graduate from high school. A greater effort to help high school seniors successfully complete high school may assist in reducing DEP attrition. For example, high school seniors with marginal grades could be paired with fellow DEP participants who have academic strengths. This teamwork could create a sense of belonging for all DEP participants, as well as provide the extra help that some seniors need to graduate.

Perhaps, an individual leaving the DEP bases his or her decision on varying conditions of unemployment in the civilian sector. Future studies could include a variable representing an unemployment rate trend, that is, whether unemployment rates are increasing or decreasing over time. Additionally, individuals may be lured away from the DEP by employment opportunities throughout their metropolitan

area.   Future studies should explore the effects of metropolitan-level unemployment rates on DEP attrition.

The negative effects of moral waivers on DEP attrition, in the present study, are unexpected and conflict with any logical explanation.   The effects of this variable should be studied in more detail using alternative data sources.

Special attention must be given to the needs of female DEP members.   More female role models in the recruiting force may provide the guiding leadership necessary to reduce the attrition of women from the DEP.   Additionally, providing limited military medical services, such as birth control, for female DEP members may help to reduce DEP attrition by a number of young women.

To make recruiting efforts more effective, military leaders must convey a heightened sense of awareness among individual recruiters regarding groups that are prone to leave the DEP.   Recruiters could then focus more attention on groups that have a higher risk of attrition to maintain a solid pool of qualified individuals for military service. Further studies to better determine why these groups leave the DEP at higher rates would be the key to future analysis of DEP attrition behavior.

APPENDIX. HIGH SCHOOL SENIOR AND NON-HIGH SCHOOL SENIOR MODELS

Previous studies used separate models for high school seniors and non-high school seniors. (Kearl and Nelson, 1992 and Henderson, 1999) In order to determine if separate models were necessary in this thesis, a likelihood ratio test was conducted to compare the estimated coefficients from each of three models: one estimated for high school seniors, one for non-high school seniors and one for the entire group (pooled). The test statistic for the likelihood ratio test is:

$$\lambda = 2 \; [\text{Log UR} - \text{Log R}]$$

where R=restricted model
U=unrestricted model

The difference is distributed chi-square at a .05 significance level. The test statistic is 18,507, which rejects the null hypothesis of identical coefficients for the two groups. This suggests that separate models should be estimated for the two groups.

Model A1 and A2 estimate separate models for high school seniors and non-high school seniors for all-services. Table 7.1 shows the results of the all-service model (model A1) with high school seniors only. Table 7.2

shows the results of the all-service model (model A2) with
non-high school seniors.

In both models A1 and A2, all variables were
significant at the .05 level or greater. Three variables
produced unexpected signs in model A1: HISP, APIO, and
MORALWVR. Being Hispanic or Asian Pacific Islander has an
opposite effect for high school seniors. Previous studies
hypothesized that older high school seniors are more likely
to attrite from DEP. (Kearl and Nelson, 1992) This holds
true in model A1. Here the variable AGE_DEP shows that a
one-year increase in age increases the DEP attrition
likelihood by 12 percent. This age effect appears to be
equal for non-high school seniors. High school seniors
appear to be equally affected by the local area
unemployment rates as non-high school seniors. In both
models, a one-percent increase in the unemployment rate
decreases the DEP attrition likelihood by about 1 percent.
For high school seniors, females are 16 percentage points
more likely to attrite from DEP vice 8 percentage points
for non-high school seniors.

The only variable to produce an unexpected sign in
both models A1 and A2 was MORALWVR. The service variable
AIRFORCE produced the largest parameter estimate for model
A2. Among non-high school seniors, an individual in the

Air Force DEP is 7.7 percentage points more likely to become a DEP drop than an individual in the Navy DEP. The variable LOWQUAL produces a marginal effect about one-eighth the size of LOWQUAL for the high school seniors. If a high school senior scores low on the AFQT, perhaps they may also have difficulty graduating from high school. Failure to graduate from high school is a common reason that some high school seniors drop from DEP. The signs of the ARMY variable are different in models A1 and A2. For high school seniors, ARMY has a positive effect on DEP attrition, increasing the likelihood of a DEP drop by 7.7 percent. For non-high school seniors, ARMY has a negative effect on DEP attrition, decreasing the likelihood of a DEP drop by .8 percent.

Likelihood ratio tests confirmed the necessity of modeling high school seniors and non-high school seniors separately in each of the four individual service models. Tables 7.3 through 7.10 shows the results of modeling for each separate service, by high school seniors and non-high school seniors.

Table 7.1 All-Service DEP Attrition LOGIT Model,
High school seniors only
(Model A1)

Variable	Parameter Estimate		Standard Error	Marginal Effect $=(\Delta P/\Delta X)$	Percentage Effect $=(\Delta P/\Delta X \div P)$
INTERCEPT	-5.257		0.129		
FEMALE	0.812	*	0.014	0.164	0.786
BLACK	-0.080	*	0.014	-0.013	-0.062
HISP	0.056	*	0.018	0.009	0.045
APIO	0.060	**	0.025	0.010	0.048
DEPEND	-0.173	*	0.039	-0.027	-0.130
AGE_DEP	0.154	*	0.007	0.027	0.128
MNS_DEP	0.171	*	0.002	0.030	0.142
LOWQUAL	0.094	*	0.011	0.016	0.076
MORALWVR	-0.793	*	0.023	-0.102	-0.489
FY92	-0.176	*	0.017	-0.028	-0.132
FY93	-0.034	**	0.016	-0.005	-0.026
FY94	-0.053	*	0.017	-0.009	-0.041
FY95	-0.128	*	0.017	-0.020	-0.097
FY96	-0.065	*	0.021	-0.011	-0.050
UR2	-0.012	*	0.002	-0.002	-0.009
ARMY	0.419	*	0.013	0.077	0.371
MARINE	0.273	*	0.013	0.049	0.233
AIRFORCE	-0.632	*	0.018	-0.086	-0.411

N=221,125

-2 Log L =246,237

Chi-square = 12,691 (d.f.=18) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 7.2 All-Service DEP Attrition LOGIT Model
Non-high school seniors only
(Model A2)

Variable	Parameter Estimate	Standard Error	Marginal Effect $=(\Delta P/\Delta X)$	Percentage Effect $=(\Delta P/\Delta X \div P)$
INTERCEPT	-5.487	0.040		
FEMALE	0.666 *	0.009	0.088	0.751
BLACK	-0.124 *	0.011	-0.012	-0.104
HISP	-0.068 *	0.015	-0.007	-0.058
APIO	-0.186 *	0.019	-0.018	-0.153
DEPEND	-0.271 *	0.013	-0.025	-0.215
AGE_DEP	0.136 *	0.002	0.015	0.126
MNS_DEP	0.156 *	0.001	0.017	0.146
LOWQUAL	0.021 **	0.009	0.002	0.018
MORALWV	-0.509 *	0.014	-0.043	-0.369
FY92	-0.034 *	0.012	-0.003	-0.030
FY93	0.037 *	0.013	0.004	0.033
FY94	0.103 *	0.013	0.011	0.094
FY95*	-0.073 *	0.013	-0.007	-0.062
FY96*	-0.627 *	0.018	-0.051	-0.435
UR2*	-0.012 *	0.001	-0.001	-0.011
ARMY*	-0.078 *	0.010	-0.008	-0.067
MARINE*	0.162 *	0.012	0.018	0.152
AIRFORCE*	-1.148 *	0.014	-0.077	-0.655

N=744,576

-2 Log L =460,159

Chi-square = 25,941 (d.f.=18) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 7.3 Army DEP Attrition LOGIT Model
High school seniors only
(Model A3)

Variable	Parameter Estimate		Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-7.003		0.252		
FEMALE	0.930	*	0.026	0.217	0.768
BLACK	-0.035		0.027	-0.007	-0.025
HISP	0.115	*	0.042	0.024	0.085
APIO	-0.085		0.055	-0.017	-0.060
DEPEND	-0.250	*	0.087	-0.048	-0.169
AGE_DEP	0.243	*	0.014	0.052	0.183
MNS_DEP	0.236	*	0.004	0.050	0.177
LOWQUAL	0.149	*	0.026	0.031	0.111
MORALWVR	-0.332	*	0.078	-0.062	-0.220
FY92	-0.101	*	0.036	-0.020	-0.071
FY93	-0.041		0.032	-0.008	-0.029
FY94	-0.080	**	0.035	-0.016	-0.056
FY95	-0.178	*	0.033	-0.035	-0.123
FY96	-0.150	*	0.040	-0.029	-0.104
UR2	0.004		0.003	-0.001	-0.003

N=54101

-2 Log L=61499

Chi-square=5067 (d.f.=15) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 7.4 Army DEP Attrition LOGIT Model
Non-High school seniors only
(Model A4)

Variable	Parameter Estimate		Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-6.411		0.066		
FEMALE	0.640	*	0.015	0.075	0.738
BLACK	-0.045	*	0.017	-0.004	-0.040
HISP	-0.077	*	0.029	-0.007	-0.067
APIO	-0.137	*	0.035	-0.012	-0.116
DEPEND	-0.337	*	0.020	-0.027	-0.265
AGE_DEP	0.160	*	0.003	0.016	0.153
MNS_DEP	0.200	*	0.002	0.020	0.194
LOWQUAL	0.151	*	0.016	0.015	0.144
MORALWVR	-0.311	*	0.031	-0.025	-0.247
FY92	0.049	**	0.022	0.005	0.045
FY93	0.098	*	0.022	0.009	0.091
FY94	0.311	*	0.022	0.032	0.316
FY95	0.038		0.022	0.004	0.035
FY96	-0.570	*	0.031	-0.042	-0.408
UR2	0.007	*	0.002	-0.001	-0.006

N=273003

-2 Log L=157455

Chi-square=10666 (d.f.=15) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

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Table 7.5 Navy DEP Attrition LOGIT Model
High school seniors only
(Model A5)

Variable	Parameter Estimate		Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-6.011		0.231		
FEMALE	0.767	*	0.023	0.152	0.739
BLACK	0.027		0.024	0.004	0.021
HISP	0.129	*	0.030	0.022	0.106
APIO	-0.069		0.048	-0.011	-0.053
DEPEND	-0.123		0.065	-0.019	-0.094
AGE_DEP	0.198	*	0.012	0.034	0.166
MNS_DEP	0.162	*	0.004	0.028	0.135
LOWQUAL	0.160	*	0.019	0.027	0.133
MORALWVR	-0.473	*	0.032	-0.067	-0.324
FY92	-0.094	*	0.027	-0.015	-0.072
FY93	0.018		0.028	0.003	0.015
FY94	-0.013		0.030	-0.002	-0.010
FY95	-0.049		0.031	-0.008	-0.038
FY96	-0.014		0.039	-0.002	-0.011
UR2	-0.018	*	0.003	-0.003	-0.014

N=76475

-2 Log L=80544

Chi-square=3460 (d.f.=15) (p=.0001)

  * Significant at the .01 level

  ** Significant at the .05 level

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Table 7.6 Navy DEP Attrition LOGIT Model
Non-High school seniors only
(Model A6)

Variable	Parameter Estimate		Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-5.505		0.069		
FEMALE	0.728	*	0.017	0.096	0.847
BLACK	-0.140	*	0.020	-0.013	-0.118
HISP	-0.059	**	0.025	-0.006	-0.051
APIO	-0.197	*	0.034	-0.018	-0.162
DEPEND	-0.103	*	0.024	-0.010	-0.088
AGE_DEP	0.134	*	0.003	0.014	0.126
MNS_DEP	0.158	*	0.002	0.017	0.149
LOWQUAL	0.004		0.016	-0.000	-0.004
MORALWVR	-0.315	*	0.021	-0.028	-0.247
FY92	0.019		0.021	0.002	0.017
FY93	-0.043		0.023	-0.004	-0.037
FY94	0.015		0.024	0.001	0.013
FY95	-0.018		0.024	-0.002	-0.016
FY96	-0.525	*	0.033	-0.043	-0.380
UR2	-0.014	*	0.003	-0.001	-0.013

N=216701

-2 Log L=139016

Chi-square=9228 (d.f.=15) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 7.7 Marine Corps DEP Attrition LOGIT Model
High school seniors only
(Model A7)

Variable	Parameter Estimate	Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-4.298	0.248		
FEMALE	0.781 *	0.035	0.183	0.612
BLACK	-0.122 *	0.027	-0.025	-0.083
HISP	-0.023	0.030	-0.005	-0.016
APIO	0.259 *	0.039	0.057	0.190
DEPEND	-0.113	0.071	-0.023	-0.078
AGE_DEP	0.140 *	0.013	0.030	0.101
MNS_DEP	0.132 *	0.004	0.028	0.095
LOWQUAL	0.028	0.019	0.006	0.020
MORALWVR	-1.239 *	0.038	-0.189	-0.632
FY92	-0.329 *	0.031	-0.064	-0.214
FY93	-0.159 *	0.030	-0.032	-0.108
FY94	-0.097 *	0.030	-0.020	-0.067
FY95	-0.113 *	0.031	-0.023	-0.077
FY96	0.059	0.036	0.012	0.042
UR2	0.005	0.003	-0.001	-0.004

N=63994
-2 Log L=74827
Chi-square=3045 (d.f.=15) (p=.0001)
  * Significant at the .01 level
  ** Significant at the .05 level

Table 7.8 Marine Corps DEP Attrition LOGIT Model
Non-High school seniors only
(Model A8)

Variable	Parameter Estimate	Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-5.279	0.109		
FEMALE	0.561 *	0.032	0.094	0.555
BLACK	-0.172 *	0.030	-0.023	-0.135
HISP	-0.062 **	0.031	-0.008	-0.050
APIO	-0.157 *	0.039	-0.021	-0.124
DEPEND	-0.240 *	0.037	-0.031	-0.184
AGE_DEP	0.160 *	0.005	0.024	0.140
MNS_DEP	0.116 *	0.003	0.017	0.100
LOWQUAL	-0.082 *	0.021	-0.011	-0.066
MORALWVR	-1.012 *	0.032	-0.100	-0.593
FY92	-0.248 *	0.031	-0.032	-0.189
FY93	-0.111 *	0.030	-0.015	-0.089
FY94	-0.141 *	0.030	-0.019	-0.112
FY95	-0.320 *	0.032	-0.040	-0.238
FY96	-0.728 *	0.041	-0.080	-0.471
UR2	-0.013 *	0.003	-0.002	-0.010

N=116872

-2 Log L=78650

Chi-square=4060 (d.f.=15) (p=.0001)

 * Significant at the .01 level

** Significant at the .05 level

Table 7.9 Air Force DEP Attrition LOGIT Model
High school seniors only
(Model A9)

Variable	Parameter Estimate	Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-2.029	0.373		
FEMALE	0.830 *	0.032	0.104	1.028
BLACK	-0.527 *	0.049	-0.039	-0.384
HISP	-0.101	0.075	-0.009	-0.087
APIO	-0.066	0.081	-0.006	-0.057
DEPEND	-0.430 *	0.120	-0.033	-0.326
AGE_DEP	-0.055 *	0.019	-0.005	-0.048
MNS_DEP	0.180 *	0.011	0.017	0.173
LOWQUAL	0.060	0.037	0.006	0.055
MORALWVR	-0.776 *	0.107	-0.052	-0.513
FY92	-0.155 *	0.050	-0.013	-0.131
FY93	0.043	0.049	0.004	0.040
FY94	-0.177 *	0.050	-0.015	-0.148
FY95	-0.440 *	0.053	-0.033	-0.332
FY96	-0.512 *	0.062	-0.038	-0.376
UR2	-0.029 *	0.005	-0.003	-0.026

N=26555

-2 Log L=27954

Chi-square=1374 (d.f.=15) (p=.0001)

* Significant at the .01 level

** Significant at the .05 level

Table 7.10 Air Force DEP Attrition LOGIT Model
Non-High school seniors only
(Model A10)

Variable	Parameter Estimate		Standard Error	Marginal Effect	Percentage Effect
INTERCEPT	-4.982		0.105		
FEMALE	0.683	*	0.019	0.046	0.884
BLACK	-0.297	*	0.029	-0.013	-0.247
HISP	-0.064		0.044	-0.003	-0.059
APIO	-0.219	*	0.048	-0.010	-0.188
DEPEND	-0.418	*	0.031	-0.017	-0.329
AGE_DEP	0.069	*	0.004	0.004	0.068
MNS_DEP	0.140	*	0.004	0.007	0.142
LOWQUAL	-0.021		0.026	-0.001	-0.020
MORALWVR	-0.778	*	0.056	-0.027	-0.527
FY92	-0.139	*	0.030	-0.006	-0.124
FY93	0.094	*	0.029	0.005	0.093
FY94	-0.012		0.030	-0.001	-0.012
FY95	-0.285	*	0.032	-0.012	-0.238
FY96	-0.966	*	0.046	-0.031	-0.607
UR2	-0.015	*	0.003	-0.001	-0.014

N=138000

-2 Log L=83092

Chi-square=3849 (d.f.=15) (p=.0001)

  * Significant at the .01 level

  ** Significant at the .05 level

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